The Handover Toolbox: a knowledge exchange and training platform for improving patient care

The HANDOVER Toolbox:
A knowledge exchange and training environment

Hendrik Drachsler, PhD[1], Wendy Kicken, PhD[2], Marcel van der Klink, PhD[3], Slavi Stoyanov, PhD[4], Henny Boshuizen, PhD[5], Paul Barach, MD, MPH[6,7]

[1,2]Assistant professor at Centre for Learning Sciences and Technologies, Open University of the Netherlands
[3]Associate professor at Centre for Learning Sciences and Technologies, Open University of the Netherlands
[4]Research Fellow at Centre for Learning Sciences and Technologies, Open University of the Netherlands
[5]Professor at Centre for Learning Sciences and Technologies, Open University of the Netherlands
[6]Professor (adjunct), University of Stavanger, Norway, and [7]Senior Research Fellow, Utrecht Medical Centre, The Netherlands

Corresponding author:
Hendrik Drachsler, PhD
Open University, Centre for Learning Sciences and Technologies
Centre for Learning Sciences and Technologies
Valkenburgerweg 177, 6419 AT, The Netherlands
Telephone: +31(0) 45-576-2218; fax: (+31) 45-576-2907
E-mail: Hendrik.Drachsler@ou.nl

Keywords: Handover toolbox, participatory design, patient safety, patient handover, quality of care, medical education, e-learning

Word count: 3886

Abstract

Objective

Safe and effective patient handovers remain a global organizational and training challenge. The World Health Organization (WHO) lists effective handovers as one of its High 5 patient safety initiatives. Training for handover competencies is a promising approach to improve the quality of handovers. We present the Handover toolbox that aims to support different stakeholders (e.g. general practitioners, nurses, medical trainer, experts in patient handover, and medical students) to provide customized handover training for specific demands.

Methods

The Handover toolbox was designed in the context of the FP7 HANDOVER project from April 2009 until October 2011 by using the Technology Enhanced Learning Design Process (TEL-DP). TEL-DP consisted of six different methods: 1). User requirements analysis; 2). Writing personas; 3). Group Concept Mapping 4). Analysis of suitable software; 5). Plus-Minus-Interesting rating; and 6). Usability testing. TEL-DP is aligned to participatory design approaches and guaranteed a development process in close collaboration with the stakeholders.

Results

From method (1) it appeared that different kinds of trainings are needed that allow to train professionals on the job as well as medical students in their studies. Methods (2) and (3) made clear that training experts from different countries differed in their views on the desired content and delivery of handover training. This means that a one-size-fits-all training was not applicable rather a customisable learning approach, a toolbox, that allow trainers to design their own training for various target groups with specific handover information needs was a far better solution. Method (4) identified

the most suitable ready-to-use software systems that provided the required functionalities and could be further customized to the needs of the users. Method (5) and (6) resulted in several points for improvement of the Handover toolbox, mainly related to improved usability and navigation. Until the end of the development process in October 2011, 165 training experts were attracted by the toolbox and signed up for the system.

Conclusions

We developed a Handover toolbox for different stakeholders who are interested in improving handovers through customized training and learning. Its design is based on a carefully stakeholder investigation, using the TEL-DP approach which is a systematic and comprehensive design approach. It provides state of the art content about 40 handover tools with practical guidelines, a generic training design that can be customized to specific handover training needs, and enables community members to contribute own experiences and best practice examples. Next to this content, it offers an easy to use e-learning environment to support trainers in their handover classes.

The developments can only be seen as a first supportive step to achieve a better patient safety. The final implementation phase of the toolbox has only partly been achieved within the FP7 HANDOVER project. Europe's medical schools need additional support to implement the toolbox into their medical education system. Therefore, a follow-up implementation project was designed that will apply the toolbox in three University Hospitals in Germany, Spain, and Ireland.

Introduction

Safe patient handovers require that accurate, reliable and relevant information is clearly communicated between one healthcare giver to another. Improperly conducted handovers lead to wrong treatment, delays in medical diagnosis, life threatening adverse events, patient complaints, increased health care expenditure, increased hospital length of stay and a range of other effects that impact on the health system [1]. The World Health Organization (WHO) lists effective handovers as one of its High 5 patient safety initiatives [1]. Training for handover skills is a promising approach to improve the quality of handovers [3]. However, the need for handover training in medical education has not been clearly elucidated . Research has identified dissatisfaction amongst junior staff with current handover practices as a result of the lack of clear policies and effective training [3]. Moreover, currently in Europe, training in handover and patient safety is disjointed, lacks focus and there has been a paucity of research with regards to appropriate educational strategies [2,4,14,15].

Gaining more insight into appropriate training strategies can thus provide guidelines for improving handover through training. However, it should also be taken into account that training and learning alone is not sufficient to improve handovers. That is, training is regarded as a supportive, accompanying and even necessary condition to encourage implementation of strategies for accurate handovers. Yet, the key to effective solutions to ineffective handovers lies in the recognition that a combination of (i.) effective tools, protocols, methods (i.e, checklists for standardized steps), (ii.) interventions to change the culture of handover; and, (iii.) a supportive environment in which effective transfer of training can be ensured [18]. This perspective has been maintained when searching for a solution to ineffective handovers.

In our search for such answers it appeared that handover procedures are strongly context dependent. Thus, it may not possible and certainly not effective to design a one-size-fits-all training. Handover practices and cultures vary tremendously across different institutions and between European countries, which makes the problems and causes for these experienced problems also very diverse [14,16,19].

We developed a web-based knowledge exchange environment that helps to create a community of practice online [11,12,13], named the Handover toolbox (see: www.handovertoolbox.eu). As far as content is concerned, this environment takes into account the diversity of solutions for handovers and contains state of the art about (i.) information on standardized tools and ready to use tools to improve handover, (ii.) information on what and how to train handovers and ready to use training material, and, (iii.) guidelines on how to take into account cultural and organizational issues when improving handovers. As knowledge on these issues is continuously growing and at the same time still lacks insights on the effects of interventions on patient care practices and patient safety [2], an environment was developed that optimally combines state of the art information and user contribution and cooperation to improve the usability / conditions for use.

The Handover toolbox is based on the experience of European general practitioners, nurses, medical educational experts, experts on intervention mapping, and experts in patient handover. We used the 'Technology Enhanced Learning - Design Process' (TEL-DP) that consists of six different methods related to participatory design approaches. In the following sections first the TEL-DP and its six methods are briefly described, next, we describe the outcomes of the TEL-DP, and then we present the Handover toolbox. We conclude the paper with set of

recommendations regarding the application of the Handover toolbox to medical education in Europe.

Methods

The Technology Enhanced Learning Design Process (TEL-DP)

The TEL-DP was developed at the Centre for Learning Science and Technologies (CELSTEC) to provide customized technology enhanced learning products for specific target domains such as logistics, industry, and healthcare. In TEL-DP each method provides input or guidance for the following step in the design process, resulting in the final design of a ready-to-use tool that is developed in close cooperation with the target users. TEL-DP is therefore related to participatory design methods that include the stakeholders in the design process [23]. In this way it is not just the designer who decides on the interface or content of the product, but a sound balance is safeguarded between the vision and needs of the designers and users in the process of designing practical applications [5]. TEL-DP is a progressive refinement process that provides different versions of the prototype to the stakeholders and collects feedback for improvements until finally a satisfying version is constructed. Formative and summative evaluation plays a prominent role in the continually refinement process of creating prototypes, examining them and re-creating prototypes that provide insight into the latest solutions and their fit to the needs of the stakeholders.

INSERT FIGURE 1 ABOUT HERE

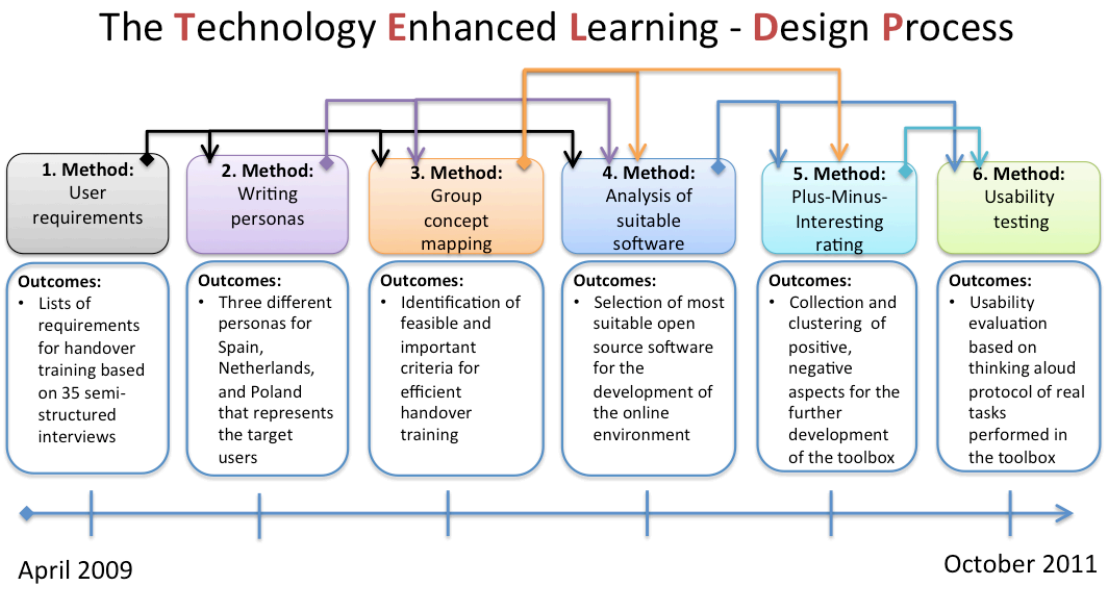


Figure 1: Overview of the TEL-DP process in the FP7 HANDOVER project to develop the toolbox. The arrows above demonstrate the effects of a single method on the following step in the design process.

The following six methods were applied in developing the Handover toolbox: 1) User requirements analysis, 2) Writing personas; 3) Group concept mapping; 4) Analysis of suitable software; 5) Plus-minus-interesting rating; and, 6) Usability testing. We describe each of the methods and their outcomes on an aggregated level, as we also want to present the functionalities and the content offered within the Handover toolbox:

1. User requirements analysis: The analysis was based on 35 semi-structured interviews with medical trainers from the Netherlands, Poland, and Spain who provided a list of requirements and issues regarding accurate handovers (see deliverable D1[1] and [19] for detailed description of the findings). It appeared that the stakeholders required an e-learning solution that can be used in role games and simulations to improve the handover process. Furthermore, the environment needs to be as flexible as possible to enable the training of professionals at the workplace [22] as well as students during their studies.

[1] http://handover.cmj.org.pl/upload/library/m1b8hmo6d0hh9fiybvx8w.pdf

2. Writing Personas: The interview findings were used to create 'Writing Personas'. A persona is a synthesis of elements drawn from a large number of users who share common job roles, demographics, and user needs, which help designers to understand whom they are designing for (ref). We created three different Personas for Spain, Poland, and Netherlands that represent the average stakeholder in each country. The personas can be found in the Handover toolbox[2].
3. Group concept mapping: This method applies a structured participative approach to support the target users to achieve a consensus about a particular issue, in our case what are important and feasible criteria for effective and efficient handover training [7]. GCM is a three-step approach that builds upon (a) idea generation, (b) sorting, and (c) rating of ideas with multidimensional scaling and hierarchical cluster analysis. First a list of ideas was composed that was derived from the interviews with the medical trainers. Then 15 experts clustered and ranked these ideas according to importance and feasibility. The results were discussed by the partners of the FP7 HANDOVER project and the outcomes were taken into account in designing the toolbox and its content. A detailed overview of the GCM approach can be found here [8]. A comprehensive overview of the outcomes of the GCM method applied in the HANODVER project can be found in this special issue [10].
4. Software selection: The software selection aimed at making the best choice of the needed web platform to support the e-learning requirements of the stakeholders. First, IT requirements were derived from the interviews and the

[2] http://handover.ou.nl/pg/blog/read/8392/writing-personas-representative-users-for-the-toolbox-stakeholders

writing personas to get a conceptual view on the collected needs, followed by composing a use case diagram[3] that showed the required connection of the functionalities in the system. After this method a first version of the Handover toolbox was created based on the best candidate software system. The first version of the handover toolbox was further customized and enrich with certified handover content. In the following two steps the toolbox was presented to different stakeholder groups for their feedback.

5. Plus, Minus, Interesting rating: The Plus, Minus, Interesting (PMI) rating method [9] was used to collect feedback on the first version of the Handover toolbox. The PMI rating was conducted at a stakeholder meeting of the HANODVER project, where 62 handover experts, were given a demonstration of the possibilities of the Handover toolbox. They were asked to write down statements on what they liked (marked with a Plus) about the Handover toolbox what they disliked about it or the objections they hold against it (both marked with a Minus), and interesting ideas that might help the designers to improve the Handover toolbox (marked with a an capital I). The statements were then sorted, based on commonalities, by three project team members using the card sorting software - *websort* [20]. This resulted in a combined view of the positive and negative aspects of the first version of the toolbox that was further developed accordingly.
6. Usability test: Finally, a usability test was conducted to evaluate the second version of the Handover toolbox with 13 training experts and medical professionals in the University Hospital in Barcelona, Spain (n = 4), Karolinska Institute in Sweden (n = 4), and University Hospital Utrecht in the

[3] http://en.wikipedia.org/wiki/Use_Case_Diagram

Netherlands (n = 5). The participants were asked to perform three tasks with the toolbox (e.g., search for information, joining a group, add a comment to existing information), while thinking out loud, telling what they are looking at, doing, and feeling. They were interviewed, and finally they were asked to fill out a questionnaire consisting of 16 items with Likert-scales and open-ended questions about participants' backgrounds, and their perceptions on particular aspects of the toolbox.

A complete description of the TEL-DP process can be found in deliverable D9[4].

Results

This section presents the final version of the Handover toolbox. We will focus on presenting the current functionalities and content that are accessible for everyone.

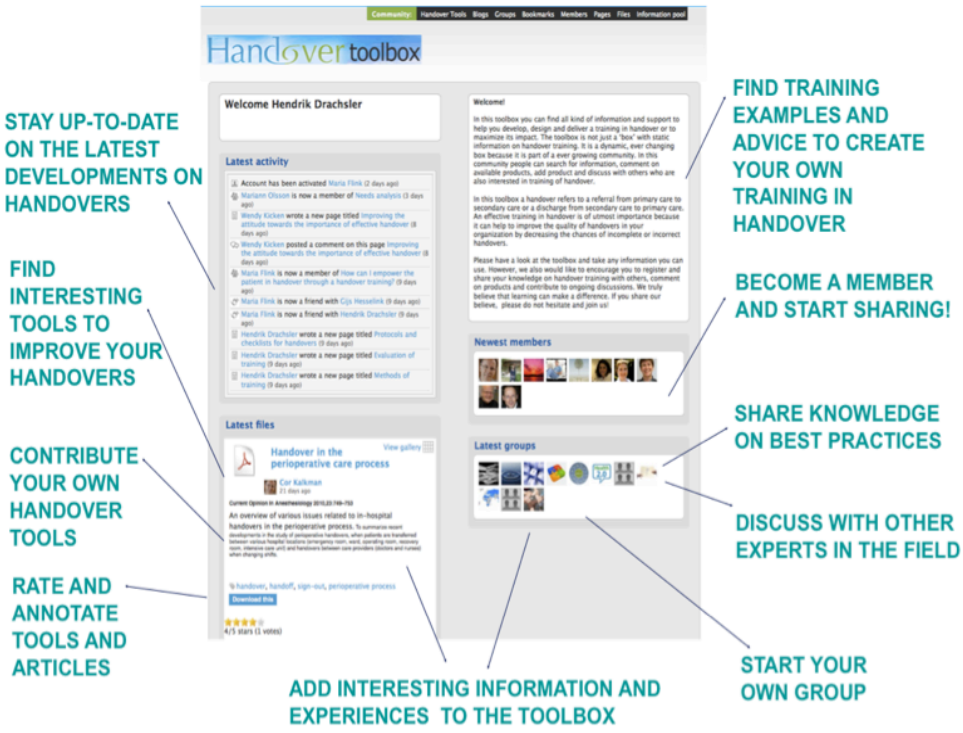
Functionality of the Handover toolbox

The Handover toolbox (www.handovertoolbox.eu) is not only a website that provides static information to its readers. It also offers various facilities for interactions (e.g., join groups or create new ones, add files, write a blog post, contribute a bookmark etc.). The toolbox is built around a pro-active user concept from scratch. It offers individuals unprecedented power to define their own personal spaces and to identify people with similar goals or with important expertise in a potentially huge member base. Its navigation and functionality is aligned to social networks like Facebook but the toolbox provides a trustful environment where all data and information in the system remain controlled and owned by the users instead by a commercial company. The Handover toolbox is a community environment that can be used as a place to exchange best practices and latest developments by experts, as well as a small-scale e-learning environment for individual trainers and their students (see

[4] http://dspace.ou.nl/handle/1820/3979

Figure 2). Hereafter we will describe the main functionalities of the Handover toolbox.

INSERT FIGURE 2 ABOUT HERE



Public access vs. protected information

A crucial aspect of the Handover toolbox is the information management that allows users to specify who can edit or view a certain resource (any file, comment, blog, page or video). The users can make the following distinctions: a.) public – resource can accessed by anyone, b.) signed-in members – resources can only be accessed by members of the handover toolbox, c.) friends - (resources can only be accessed by people on my friends list), d.) only group members – only members of a particular group can accessed the content or e.) private – the content is only visible to the individual user.

Registration sign-up for the Handover toolbox

When signing-up for the toolbox the users provide basic information that will become part of their personal profile within the toolbox. They need to provide their name, email address, password, interest in handover, a picture, and a safety code shown on the bottom of the site. After signing up for the system the users need to wait for approval of their account by the toolbox administrator, as access is only provided to trustworthy people to protect the handover community from spammers. After receiving the approval mail from the administrator the new toolbox member can access the toolbox and get contact with other members. The new user has the opportunity to join groups, create own groups and comment on any file that is available.

The Personal Cockpit

The Personal Cockpit is the first place that users of the toolbox encounter after signing in. It is beneficial to further specify the personal cockpit to be more meaningful for others in the network. After being more active within the toolbox the latest activities of 'friends' and 'groups' are listed in the personal cockpit, it therefore provides a personal view into the activities of the handover community.

Groups

The core element in the toolbox is the notion of groups[5], meaning that information related to various aspects of handovers are categorized and presented in groups. Each group has a theme and a group leader who initiated the group and gathered the initial information. The following six groups were initiated by the HANDOVER project members. The themes were derived from the information gathered by the interviews with medical trainers, the PMI-rating and the usability test:

1. How to use the toolbox
2. Protocols, checklists and other standardized tools to improve handover

[5] http://handover.ou.nl/pg/groups

3. Communication skills, Knowledge, Awareness, and Attitude
4. Empowerment of the patients during handover practices
5. External and organizational factors influencing the effectiveness of handover
6. Handover Training

Open and closed groups

Groups by default have free access policies (open group) allowing all visitors to see and download the information in this group. Everyone who is a registered member of the Handover toolbox could become a member of a group. Membership allows possibilities for active participation, for example for uploading one's own materials to the group. However, some groups employs a restricted policy (closed group), meaning that the group leader can decide who can become a group member or not. This is particularly useful for trainers who want to use the Handover toolbox as a place where their trainees can find information and can discuss with fellow trainees confidentially without being hindered by the presence of any outsiders. In that case a new group can be created, the trainees can be invited to become members of the group, and training assignments and information can be shared with them.

Discussing, commenting, rating

The user-generated content concept of the Handover toolbox is based on the active behavior of its members. Therefore, the users can always contribute to an ongoing discussion or start a new one.

Furthermore, registered members have the opportunity to comment on all resources in the toolbox like ongoing discussions, files, pictures, bookmarks etc. In addition the users can rate resources on a scale from 1 to 5 stars, which can be useful for other users to find quickly the most appreciated resources. The rating is a central instrument to highlight information that seems to be very relevant. It also helps to filter high

quality contributions from the user-generated content that can, after review by the handover experts, become part of the certified-content section.

Adding files

Registered users can always add files to their own personal profile. Once a file becomes part of the personal profile it can be everywhere linked and reused within the toolbox (in a discussion, group, or blog posting). If you are a member of a group, it is possible to add a file to this group directly. In that way specific groups can collect in relative short time through a community effort a comprehensive collection of relevant files for the topic at hand.

Contribute bookmarks

The toolbox has a very powerful bookmarking instrument that enables its users to contribute relevant webpages as bookmarks directly to the Handover toolbox. The so-called *bookmarklet* is a little button registered users can add to their browser. Whenever they discover an interesting webpage or resource they can click the new button (bookmarklet) in the browser and a web form is shown to the user. After filling the form and pressing save the website is directly stored in the Handover toolbox. Depending on the information management settings it will be distributed to a specific group as described in the section public vs. protected information.

Embed videos

The Handover toolbox supports embedding videos in any text area (blog, wiki page, etc.) from public video sharing sites such as vimeo.org or youtube.com. Users can simply copy and paste the appropriate video sharing link into a discussion, page or blog posting as plain text, and the video will be embed and playable in the content. This approach also enables to integrate own produced videos by uploading them to one of the public video sharing sites and integrate them later on into the toolbox.

Available content within the Handover toolbox

The fact that anyone could upload information to the toolbox and can even start a new group can be regarded as an appealing feature of the toolbox. However, at the same time this holds the danger that in the long run the Handover toolbox also contains information which is not always entirely reliable or even counterproductive for improving handovers. To assure the quality of the information the toolbox was extended with a part representing 'certified-content', called 'Handover Tools'. The section 'Handover Tools' provides the most relevant evidence-based tools, strategies and recommendations from the literature. Members of the Handover toolbox can rate and comment the information and tools provided. The information can only be edited by experts of the Handover community and not be changed due to the information management restrictions. The content in the Handover Tools is organized according to six main categories that are in line with the groups that are defined by the handover team: 1. Interviews with Handover experts on video, 2. Communication skills, knowledge awareness and attitude, 3. Protocols and checklists for handover, 4. Empowerment of the patient, 5. External and organizational factors, 6. A generic training in handover. In the following section we will give a brief overview of the certified content section more detailed information about each topic can be found in the toolbox[6].

Interviews with Handover experts on video

In the first section of the handover tools, a collection of 22 interviews with patient handover experts from five different countries can be found. The interviews cover a broad range of topics around the handover topic like: a.) Paul Barach about a future European research agenda around handover, b.) Cor Kalkman about the role of video

[6] http://handover.ou.nl/pg/pages/view/3587/

taping for reflection of handover processes, c.) Gijs Hesselink about organizational culture in handover processes, d.) Slavi Stoyanov about research findings which showed that handover training is not sufficient to improve problematic handovers, e.) Julie Johnson who explains how process mapping can be used to understand the process of handover, and many more.

Communication skills, knowledge awareness, and attitude

This section is devoted to the importance of communication, awareness, and attitude during the handover process. The FP7 HANDOVER project advocates a combination of training communication skills, improving knowledge of safe practices, increasing awareness (being more alert for mistakes to happen) and adapting attitudes accordingly. This can create a positive effect on the improvement of patient handovers and avoidance of mistakes that often occur due to ineffective or incomplete communication.

Protocols and checklists for handover

Current handovers are often unreliable and highly variable. Standardization of handover content and process might improve the safety of handovers by ensuring consistency in critical information exchanges. The FP7 HANDOVER project suggests a collection of tools that can be used to standardize the handover process. Because there are many standardized tools available, we divided the tools into four categories, which are related to different types of handovers. These categories are: a) Internal handover: handover inside the hospital or primary care services, b) Medication handover: c) Content that is handed over, d) The actual handover process.

Empowerment of the patient

Handover is a complex process involving multiple stakeholders. At the center of the handover process are the patients and their families. In health care research

there is growing evidence that patient participation leads to more effective handovers between different settings and in the FP7 HANDOVER project it was found that patients can play an important role. Patients in Sweden, The Netherlands, Spain, Italy and Poland all accepted a higher degree of responsibility for transferring information to their next healthcare provider. However, it was also found that there is room for improvement in the communication between patients and health care professionals. Patient participation can be enabled by several factors that are discussed in this section.

External and organizational factors

The importance of contextual factors influencing the implementation patient safety practice is a relevant theme for patient safety research. In this section on the toolbox we identify available tools and strategies for describing and assessing the external and organizational factors influencing handover. In order to achieve this, we first defined the handover settings from a patient safety perspective and propose tools for describing and assessing the features influencing the handover implementation according to the state of the art research.

A generic training in handover

Next to different content of the handover toolbox, a generic training concept that can be adapted to different handover training needs is provided. The adoption of the generic training can be done by following the ADDIE model [24]. The ADDIE model is a generic process traditionally used by instructional designers and training developers. It consist of five phases: 1. Analysis, 2. Design, 3. Development, 4. Implementation, and 5. Evaluation that represent a dynamic, flexible guideline for building effective trainings. For each of these steps does the toolbox offer several building blocks (i.e, alternatives) that can be selected and combined by the training

designers. These can be considered as Lego blocks that can pick up to build a customized training for certain demands in handover. The suggested tools are ranging from a description how to apply process mapping until tutoring strategies for effective instructions in internal medicine.

Conclusions

Communication failures at handover is a major source of error in patient care leading to significant adverse events. Research has identified dissatisfaction amongst junior staff with current practices as a result of the lack of policies and training. The current training in handover and patient safety is disjointed, lacks focus and there has been a failure to carry out sufficient research with regards to appropriate educational strategies.

The Handover toolbox attempts to address this void by providing an online community environment to support trainers with information about the content of handover trainings but also offer them support in designing and delivering training.
Its design is based on a stakeholder consultation using the TEL-DP approach which is a systematic and comprehensive design approach.

The toolbox provides a state of the art collection of 40 handover tools with practical guidelines, methods and related articles. Next to this content, it offers an easy to use e-learning environment to support trainers in their handover classes. The toolbox is a supportive environment for people that want to provide training for handover for specific demands. But this can only be seen as first steps towards a better patient safety. The final implementation phase has only partly been achieved within the FP7 HANDOVER project. Therefore, a follow-up implementation project was designed that will apply the toolbox in three University Hospitals in Germany,

Spain, and Ireland[7]. The emphasis on an adaptable, flexible training approach significantly enhances the potential to facilitate transfer outcomes into University hospitals across Europe but also to other domains that are effected by handover processes like retirements homes, general practice, people with disability and pediatric communities.

References

[1] Joint Commission on Accreditation of Healthcare Organizations. Root causes of sentinel events. http://www.jointcommission.org/SentinelEvents/Statistics/. [Accessed 10th September 2012.]

[2] Joint Commission for Patient Safety and High 5s Initiative http://www.jointcommissioninternational.org/WHO-Collaborating-Centre-for-Patient-Safety-Solutions/ [Accessed 10th September 2012.]

[3] Arora VM, Johnson JK, Meltzer DO et al. A theoretical framework and competency based approach to improving handoffs. Qual Saf Health Care 2008;17:11-14.

[4] Gordon M, Findley R. Educational interventions to improve handover in health care: a systematic review. *Medical Education* 2011;**45**:1081–1089.

[5] Gordon M. Handover in paediatrics. Junior perceptions of current practice in the northwest region. *Arch Dis Child* 2010;**95**(Suppl 1):69.

[6] Cohen MD, Hilligoss PB. The published literature on handoffs in hospitals: Deficiencies identified in an extensive review. Qual Saf Health Care. 2010;19:493–497.

[7] www.patient-project.eu

[7] Philibert I. Use of strategies from highreliability organisations to the patient handoff by resident physicians: Practical implications. Qual Saf Health Care. 2009;18: 261–266.

[8] Arora V, Johnson J, Lovinger D, Humphrey HJ, Meltzer DO. Communication failures in patient sign-out and suggestions for improvement: A critical incident analysis. Qual Saf Health Care. 2005;14:401–407.

[9] Gandhi TK. Fumbled handoffs: One dropped ball after another. Ann Intern Med. 2005;142:352–358.

[2]

[4] Reisenberg LA, Jaeger J, Padmore JS. Residents' and attending physicians' hand-offs: a systematic review of the literature. *Acad Med* 2009;**84**:1775–87.

[5] Stoyanov S, Kicken W, Boon J, Bitter M. *Ontwerpbenaderingen voor leernetwerken* (Designapproaches for learning networks). In PB Sloep, M van der Klink, F Brouns, J van Bruggen, W Didderen (Eds.) (pp. 71-86). Leernetwerken; Kennisdeling, kennisontwikkeling en de leerprocessen 2011. Houten, Nederland: Bohn, Stafleu, Van Loghum.

[6] Stoyanov S, Hoogveld AWM, Kirschner PA. *Mapping Future Education and Training: Group Concept Mapping Study.* Heerlen, The Netherlands: Open University of the Netherlands; EU Forlic project 2010.

[7] Stoyanov S, Kirschner PA. Expert concept mapping method for defining the characteristics of adaptive e-learning: ALFANET project case. *Educational Technology Research and Development* 2004;**52**(2):41–56.

[8] Trochim W. An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning* 1989;**12**:1–16.

[9] De Bono E. *Serious Creativity: using the power of lateral thinking to create*

new ideas. New York: Harper Business 1992.

[10] Stoyanov S, Boshuizen H, Groene O, Van der Klink M, Kicken W, Drachsler H, Barach P, (submitted). Mapping Clinical Handover Educational Interventions. BMJ Quality & Safety, XX:XX:XX

[11] Fuller, A, Hodkinson, H, Hodkinson, P, Unwin, L. Learning as Peripherals participation in communities of practice: a reassessment of key concepts in workplace learning. British Educational Research Journal. 2002.

[12] Brathwaite J, Runciman WB, Merry AF. Towards safer, better healthcare: harnessing the natural properties of complex sociotechnical Systems. Qual Saf Health Care 2009.

[13] Ranmuthugala G, Cunningham FC, Plumb JJ, Long J, Georgiou A, Westbrook JI, Braithwaite J. A realist evaluation of the role of communities of practice in changing healthcare practice. Implementation Science. 2011.

[14] Johnson J, Barach P. (2009). Patient care handovers: what it will take to ensure quality and safety during times of transition. *Med J Aust*., 190, (11), 110-112.

[15] Jeffcott SA, Evans SM, Cameron PA, Chin GS, Ibrahim JE. (2009). Improving measurement in clinical handover. Qualsaf Health Care. 2009 Aug;18(4):272-7.

[16] http://www.jointcommission.org/SentinelEvents/Statistics/

[17]

[18] Safe Handover: Safe Patients – Guidance on Clinical Handover for Clinicians and Managers. Australian Medical Association; 2006. Available at: www.ama.com.au/web.nsf/doc/WEEN6XFDSP/$file/Clinical_Handover.pdf.

[19] Kicken W, Van der Klink M, Barach P (submitted). Handover training: Does one size fit all? The merits of mass customization. BMJ Quality & Safety, XX:XX:XX.

[20] http://websort.net [Accessed 14 May 2012.]

[21] Barach P, Moss F (accepted) Delivering safe health care. BMJ 323 (7313), 585-586.

[22] Marsick V, (2006) Informal strategic learning in the workplace. In Streumer J.N. (Ed.) *Work-related learning,* 51-69. Dordrecht: Springer.

[23] Douglas Schuler, Aki Namioka, Participatory Design: Principles and Practices, Lawrence Erlbaum Associates, Inc., Mahwah, NJ, 1993

[24] Molenda, Michael (May/June 2003). "In Search of the Elusive ADDIE Model". *Performance improvement* 42 (5): 34–37.